

What is claimed is:

1. A spinal implant assembly for insertion between adjacent first and second vertebrae, said implant comprising:

5 a first plate including a first surface configured to engage the first vertebra and an opposite second surface, and

a second plate including a third surface configured to engage the second vertebra and a opposite fourth surface having a bearing portion configured engage the second surface of the first plate, wherein said first and second plates comprise a metal matrix composite including a
10 metallic matrix and a reinforcing component dispersed within the metallic matrix.

2. The spinal implant assembly of claim 1 wherein the metallic matrix comprises a titanium, titanium aluminum alloy, zirconium or niobium or a mixture thereof.

15 3. The spinal implant assembly of claim 2 wherein the reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, Al₂O₃, and mixtures thereof.

20 4. The spinal implant assembly of claim 1 wherein the reinforcing component is a ceramic.

5. The spinal implant assembly of claim 1 wherein the reinforcing component is an intermetallic material.

6. The spinal implant assembly of claim 1 wherein the metallic matrix composite includes between about 1 wt % and about 90 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

5

7. The spinal implant assembly of claim 6 wherein the metallic matrix composite includes between about 20 wt % and about 80-wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

10

8. The spinal implant assembly of claim 7 wherein the metallic matrix composite includes between about 10 wt % and about 30-wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

15

9. The spinal implant assembly of claim 1 wherein the first surface of the first plate has a porosity of greater than about 5 %.

10. The spinal implant assembly of claim 9 wherein the first surface of the first plate has a porosity of greater than about 10 %.

20

11. The spinal implant assembly of claim 9 wherein the metallic matrix material is impregnated with one or more therapeutic agents.

12. The spinal implant assembly of claim 9 wherein the metallic matrix material is impregnated with a bone growth-inducing agent.

13. The spinal implant assembly of claim 11 wherein the metallic matrix material is impregnated with a bone growth-inducing agent.

14. The spinal implant assembly of claim 1 wherein the metal matrix composite is selected to exhibit a surface hardness of at least 20 Rc.

15. The spinal implant assembly of claim 1 wherein the metal matrix composite is selected to exhibit a surface hardness of at least about 45 Rc.

16. The spinal implant assembly of claim 1 wherein the metal matrix material has a density of greater than about 80 %.

17. The spinal implant assembly of claim 16 wherein the metal matrix material has a density of greater than about 90 %.

18. The spinal implant assembly of claim 1 wherein the reinforcing component is homogeneously dispersed throughout the metallic matrix material.

19. The spinal implant assembly of claim 1 wherein the reinforcing component is inhomogeneously dispersed throughout the metallic matrix material.

20. The spinal implant assembly of claim 1 wherein the first plate exhibits a concentrate gradient of the reinforcing component decreasing from the first surface to the second surface.

5

21. The spinal implant assembly of claim 1 wherein the second surface of the first plate comprises a convex protuberance and the fourth surface of the second plate comprises a concave receptacle to receive the convex protuberance.

10

22. The spinal implant assembly of claim 1 wherein the first plate and the second plate are configured to allow translational and rotational movement of the first plate relative to the second plate.

15

23. The spinal implant assembly of claim 1 wherein the first surface comprises bone-engaging structures.

24. The spinal implant assembly of claim 23 wherein the bone engaging structures include one or more of: ridges, teeth, grooves, rails, and wire mesh.

20

25. The spinal implant assembly of claim 1 comprising a flange extending at an angle oblique to the first surface and positioned to overlay bone tissue when the first surface engages the first vertebra.

26. The spinal implant assembly of claim 1 wherein the first plate or the second plate comprises a metal matrix composite that exhibits a bimodal porosity.

27. The spinal implant assembly of claim 26 wherein the first surface of the first plate or the third surface of the second plate exhibits a bimodal porosity.

28. The spinal implant assembly of claim 26 wherein the metal matrix composite comprises two or more layers including a sintered layer over an integrated porous layer.

29. The spinal implant assembly of claim 1 wherein the first plate comprises a first metal matrix composite and the second plate comprises a second metal matrix composite different from the first metal matrix composite.

30. The spinal implant assembly of claim 29 wherein the first metal matrix composite includes a first reinforcing material and the second metal matrix composite includes a second reinforcing material different from the first reinforcing material.

31. The spinal implant assembly of claim 29 wherein the first metal matrix composite has a first porosity and the second metal matrix composite has a second porosity different from the first porosity.

32. The spinal implant assembly of claim 29 wherein the first metal matrix composite has a first porosity and the second metal matrix composite is about 100 % dense.

33. The spinal implant assembly of claim 1, wherein the first surface of the first plate has a bimodal porous structure.

5 34. A spinal implant assembly for insertion between adjacent first and second vertebrae, said implant comprising:

a first plate including a first surface configured to engage the first vertebra and an opposite second surface having a first recess, and

10 a second plate including a third surface configured to engage the second vertebra and a opposite fourth surface having a second recess opposing the first recess on the first plate; and

an articulating element disposed between the first recess and the second recess, wherein the articulating element and the first and second plates each comprise a metal matrix composite comprising a metallic matrix and a reinforcing component dispersed with in the metallic matrix.

15 35. The spinal implant assembly of claim 34 wherein the articulating element is spherical, cylindrical, elliptical, disk shaped, or wafer shaped.

20 36. The spinal implant assembly of claim 34 wherein the metallic matrix composite includes between about 1 wt % and about 90 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

37. The spinal implant assembly of claim 36 wherein the metallic matrix composite includes between about 20 wt % and about 80-wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

5 38. The spinal implant assembly of claim 34 wherein the first plate and the articulating element are a one-piece structure.

39. The spinal implant assembly of claim 34 wherein the first plate and the articulating element are non integral.

10 40. The spinal implant assembly of claim 34 wherein the metallic matrix composite includes between about 10 wt % and about 30-wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

15 41. The spinal implant assembly of claim 34 wherein the first surface of the first plate has a porosity of greater than about 5 %.

42. The spinal implant assembly of claim 34 wherein the first surface of the first plate has a porosity of greater than about 10 %.

20 43. The spinal implant assembly of claim 41 wherein the metallic matrix material is impregnated with one or more therapeutic agents.

44. A medical device comprising:

an implantable portion for the treatment or diagnosis of a patient, said portion comprising a first layer including a metal matrix composite comprising a metal matrix and a reinforcing component dispersed with in the matrix.

5

45. The device of claim 44 comprising a disc prosthesis.

46. The device of claim 44 comprising a catheter.

10

47. The device of claim 44 comprising a bone plate.

48. The device of claim 44 comprising an electrode lead for a pacemaker or a stimulation electrode.

15

49. The device of claim 44 wherein the metal matrix composite comprises a component of the group consisting of: titanium, titanium aluminum alloy, zirconium, niobium, cobalt, chromium alloy, tantalum, tantalum alloy, nitinol, stainless steel, and/or a mixture thereof.

20

50. The device of claim 44 wherein the reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, AlO₃, and mixtures thereof.

51. The device of claim 44 wherein the metal matrix composite comprises between 1 wt % and 90-wt % of the reinforcing component.

52. The device of claim 44 wherein the implantable portion is impregnated with a therapeutic composition.

53. A medical device comprising:
a disc prosthesis comprising a first layer including a first metal matrix composite comprising a metal matrix and a first reinforcing component dispersed within the matrix.

54. The spinal implant of claim 53 wherein the first metallic matrix comprises a titanium, titanium aluminum alloy, zirconium, niobium, or a mixture thereof.

55. The device of claim 53 wherein the first reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, Al₂O₃, and mixtures thereof.

56. The device of claim 53 wherein the first metallic matrix composite includes between about 1 wt % and about 90 wt % of the first reinforcing component, based upon the total weight of the metallic matrix composite.

57. The device of claim 56 wherein the first metallic matrix composite includes between about 20 wt % and about 80 wt % of the first reinforcing component, based upon the total weight of the metallic matrix composite.

5 58. The device of claim 57 wherein the first metallic matrix composite includes between about 10 wt % and about 30-wt % of the first reinforcing component, based upon the total weight of the metallic matrix composite.

10 59. The device of claim 53 comprising a second layer including a second metal matrix composite.

60. The device of claim 59 wherein the second metal matrix composite is different from the first metal matrix composite.

15 61. The device of claim 59 wherein the second metal matrix composite includes a second reinforcing component different from the first reinforcing component.

20 62. The device of claim 59 wherein the first layer is configured to have a first porosity and the second layer is configured to have a second porosity different from the first porosity.

63. The device of claim 59 comprising one or more therapeutic agents.

64. The device of claim 53 comprising a sintered layer overlaying the first layer.

65. A medical device comprising:

a catheter including an implantable portion for the treatment or diagnosis of a patient, said implantable portion comprising a metal matrix composite including a metal matrix and a reinforcing component dispersed with in the matrix.

66. The device of claim 65 wherein the metallic matrix composite include a metal or metal alloy selected from the group consisting of: titanium, titanium-aluminum alloy, zirconium and niobium or a mixture thereof.

67. The device of claim 65 wherein the reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, Al₂O₃, and mixtures thereof.

68. The device of claim 65 wherein the metallic matrix composite includes between about 1 wt % and about 90 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

69. The device of claim 68 wherein the metallic matrix composite includes between about 20 wt % and about 80 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

70. The device of claim 65 wherein metal matrix composite has a porosity of greater than about 5 %.

71. The device of claim 65 wherein the metallic matrix composite is impregnated with one or more therapeutic agents.

72. The device of claim 65 wherein metal matrix composite exhibits a plurality of pores having differing volumes.

73. The device of claim 65 wherein the metal matrix composite comprises a sintered layer.

74. A medical device comprising:
an electrode lead for a pacemaker or a stimulation electrode including an implantable portion for the treatment or diagnosis of a patient, said portion comprising a first layer including a metal matrix composite comprising a metal matrix and a reinforcing component dispersed with in the matrix.

75. The device of claim 74 wherein the metallic matrix composite include a metal or metal alloy selected from the group consisting of: titanium, titanium-aluminum alloy, zirconium and niobium or a mixture thereof.

76. The device of claim 74 wherein the reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, Al₂O₃, and mixtures thereof.

5 77. The device of claim 74 wherein the metallic matrix composite includes between about 1 wt % and about 90 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

10 78. The device of claim 67 wherein the metallic matrix composite includes between about 20 wt % and about 80 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

15 79. The device of claim 68 wherein the metallic matrix composite includes between about 10 wt % and about 30 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

80. The device of claim 74 wherein metal matrix composite has a porosity of greater than about 5 %.

20 81. The device of claim 80 wherein metal matrix composite has a porosity of greater than about 10 %.

82. The device of claim 74 wherein the metallic matrix composite is impregnated with one or more therapeutic agents.

83. The device of claim 74 wherein metal matrix composite exhibits a plurality of pores having differing volumes..

84. The device of claim 74 wherein the metal matrix composite comprises a sintered layer.

85. A medical device comprising:
a bone plate for the treatment or diagnosis of a patient, said portion comprising a first layer including a metal matrix composite comprising a metal matrix and a reinforcing component dispersed with in the matrix.

86. The device of claim 85 wherein the metallic matrix composite include a metal or metal alloy selected from the group consisting of: titanium, titanium-aluminum alloy, zirconium and niobium or a mixture thereof.

87. The device of claim 85 wherein the reinforcing component is selected from the group consisting of: TiC, TiB₂, TiN, TiAl, WC, BC₄, BN, diamond, ZrO₂, Al₂O₃, and mixtures thereof.

88. The device of claim 85 wherein the metallic matrix composite includes between about 1 wt % and about 90 wt % of the reinforcing component, based upon the total weight of the metallic matrix composite.

5 89. The device of claim 85 wherein metal matrix composite has a porosity of greater than about 5 %.

90. The device of claim 85 wherein the metallic matrix composite is impregnated with one or more therapeutic agents.

10 91. The device of claim 85 wherein metal matrix composite exhibits a plurality of pores having differing volumes.

15 92. The device of claim 85 wherein the metal matrix composite comprises a sintered layer.

93. A method of treating a spinal defect, said method comprising:
preparing a disc space between two adjacent vertebrae to receive a spinal implant
inserting a spinal implant assembly, said assembly comprising:
20 a first plate including a first surface to engage to a first vertebra and an opposite second surface
and
a second plate including a third surface to engage to a second vertebra and an opposite
third surface to bear against the second surface of the first plate, wherein the first plate and the

second plate are composed of a metal matrix composite comprising a metallic matrix including a biocompatible metal or metal alloy and a reinforcing component dispersed within the metallic matrix.

5 94. The method of claim 93 wherein said preparing comprises performing a discectomy.

 95. The method of claim 93 comprising impregnating at least a portion of the spinal implant with a therapeutic composition.

10

 96. The method of claim 93 comprising securing the spinal implant at least one vertebral body with a bone fastener.